

# Climate Resilience and Water Security: Key Messages from the REACH Kenya Programme (2015-2024).



REACH Kenya

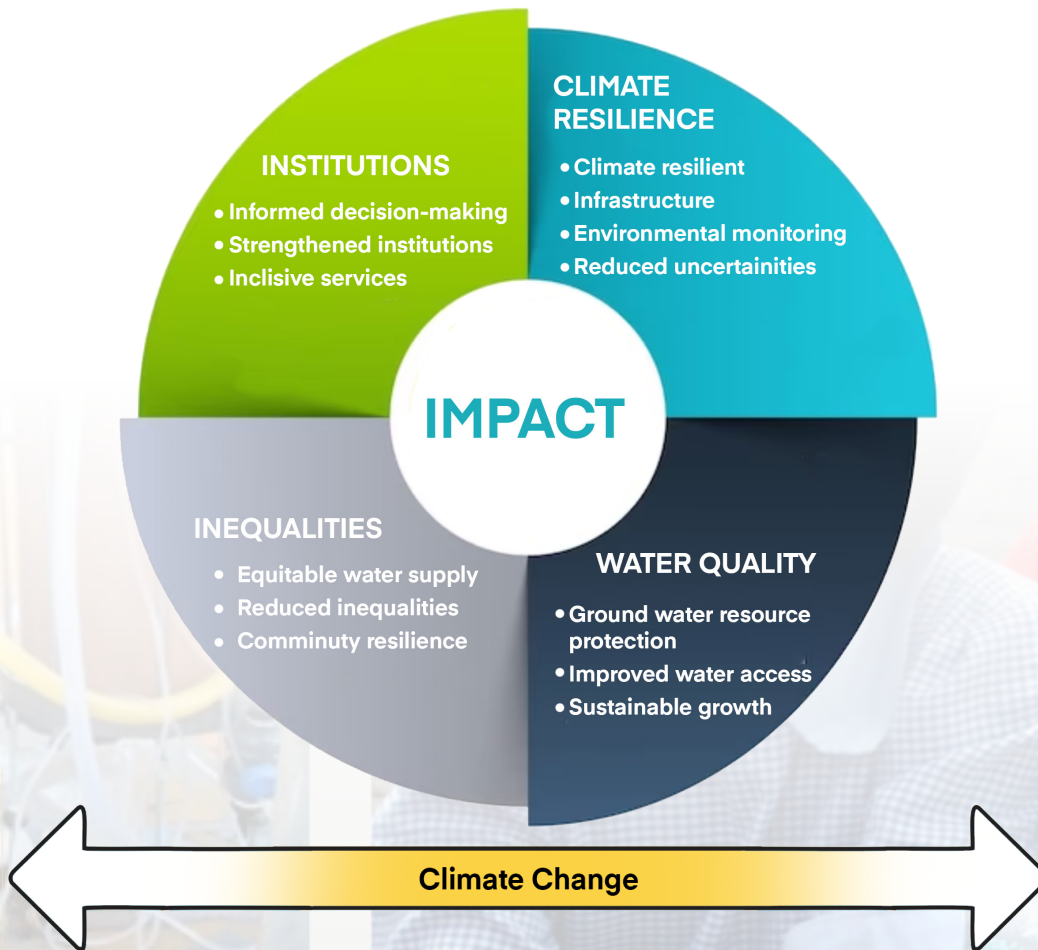


## **SYNOPSIS OF THE REACH KENYA PROGRAMME**

The links between water security and climate are broadly well understood but poorly evidenced, particularly at the scales appropriate for policy and practice to advance water security in low- and middle-income countries. In this regard, the REACH "Improving Water Security for the Poor" Project (IWSP Research) was launched in 2015 to improve water security for 10 million poor people in Africa and Asia by 2024. It is funded by UK Aid Direct from the UK Foreign, Commonwealth & Development Office (FCDO) for the benefit of developing countries (Programme Code 201880).

The REACH Programme themes are as follows:

- Building Capacity for Climate Resilience;
- Strengthening Institutions for Water Security;
- Improving Water Quality Management; and
- Reducing Inequalities in Water Security.





## BUILDING CAPACITY FOR CLIMATE RESILIENCE

### ***1. Climate change and variability pose significant challenges to water security in Kenya, requiring proactive measures to mitigate its impacts.***

Climate change and variability affect the water (hydrological) cycle through changes in rainfall patterns and amounts, increasing frequency and magnitude of droughts and floods, and rising temperatures that increase evaporation rates from surface water bodies and decrease rainfall recharge (infiltration rates) into groundwater systems, thus posing a significant threat to water security in Kenya.

These changes can lead to water scarcity, reduced water availability, water pollution, changes in water quality, and increased competition for limited water resources. As a result, these challenges must be addressed through evidence-informed and risk-based proactive measures, such as protecting (ground)water catchment areas, implementing water conservation practices, investing in, and maintaining water storage infrastructure, and promoting adaptive water management practices and tools for risk-based decision-making.



Extensive Gully erosion near Lolupe Primary School, Lodwar

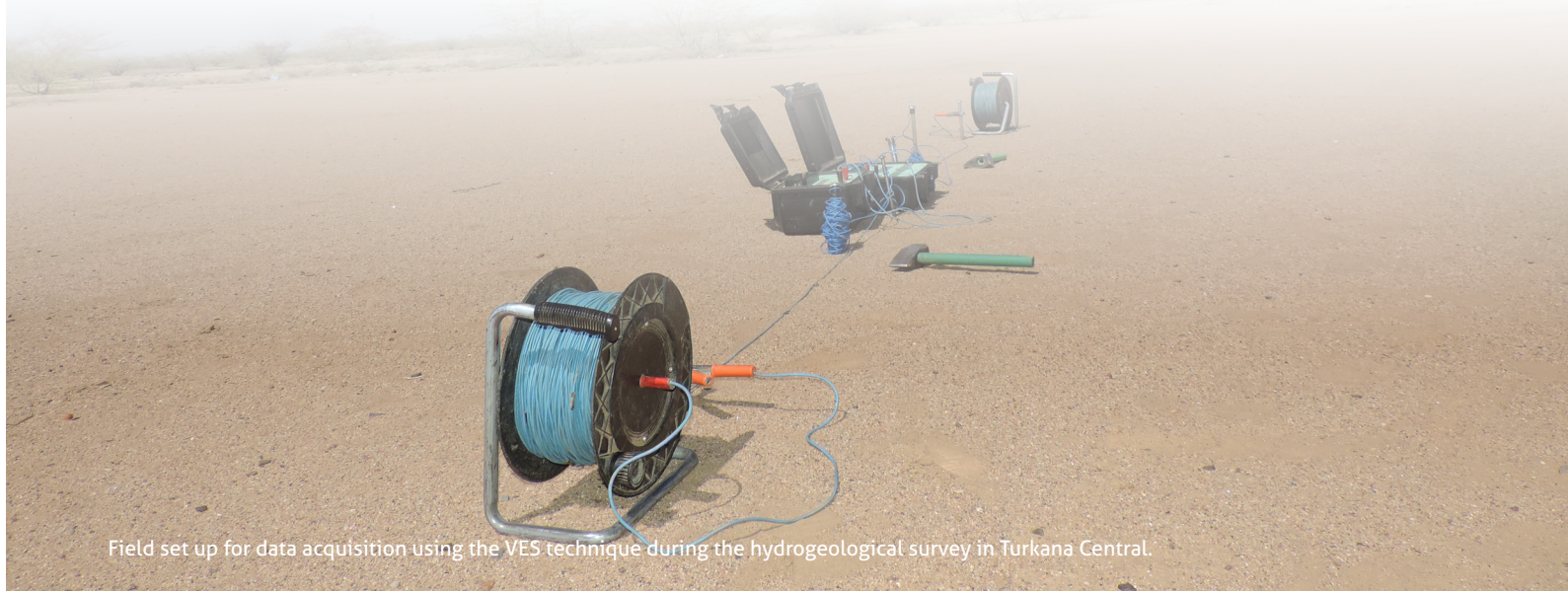
### ***2. Investing in groundwater studies is a sure way to secure water supplies in ASALs under climate change and avoids costly investment mistakes.***

Our groundwater study in Lodwar Municipality started from ground zero. The town has been extracting potable groundwater from its aquifers with scant knowledge of the aquifer characteristics, storage volumes, and temporal/spatial water amount and quality variability. Our multi-disciplinary (geology, hydrogeology, geophysics, climate, hydrology, hydrochemistry, water isotopes) study in a 400km<sup>2</sup> area encompassing Lodwar town and its environs revealed a young age (<30 years) freshwater multi-aquifer system we termed the Lodwar Alluvial Aquifer System (LAAS) that includes the high-yielding Napuu aquifer.



The study estimated a storage volume of about 1.3 BCM and a safe annual abstraction of slightly over 100 MCM, which can support a population of 2 million people and withstand consecutive drought periods of up to 3-5 years without significant decline. It further revealed that the LAAS strongly depends on pulsed recharge from the Turkwel and Kawalase rivers, resulting from heavy rainfall in their catchment areas.

The system is subject to climate-hydrology-driven quality variations at seasonal and longer timescales. These results have informed us on the most effective approaches to utilising, managing and sustaining the system under climate change and variability.



Field set up for data acquisition using the VES technique during the hydrogeological survey in Turkana Central.

### ***3. Groundwater systems and their recharge catchments must be protected for climate resilience and water security through appropriate policies and programmes.***

Our research has shown that the LAAS receives significant recharge from the Turkwel River and Kawalase Rivers, with the latter being essential to the Napuu sub-system. A multi-stakeholder approach is critical because the Turkwel River catchment upstream of the LAAS comprises about 20,000 km<sup>2</sup> of land area.

Protective actions at the local level are also essential since Lodwar town “sits” on the system, so it is also susceptible to pollution from land-based sanitation systems and waste disposal practices. Further, our water demand versus irrigation scenario analysis for the 2030s and 2080s



One of the first boreholes at Napuu aquifer.



in the Turkwel River basin shows that the probability of experiencing severe risks of unmet water demand and groundwater depletion posed by future climate rises by up to three times as the result of the potential irrigation expansion.

Our results suggest that policy decisions related to water demand management will have important implications for water scarcity in the basin. Cognisant of the REACH Programme findings, the Turkana County Government has, since 2019, been taking concrete steps towards aquifer protection, groundwater development, and management in its jurisdiction. The REACH Programme has also developed and supported the implementation of a long-term Environmental Management and Monitoring Plan (EMMP) for the LAAS.

#### ***4. Innovative approaches to managing urban water supply systems and embedded efficiencies in operations and maintenance ensure sustainable water services in the face of climate risks.***

Water supply infrastructure is the hardware built to provide access to available water. The whole infrastructure system comprises several well-coordinated sub-systems to provide sufficient and reliable water to users. Water utilities situated in arid and semi-arid regions, such as Lodwar Water and Sanitation Company (LOWASCO) in Lodwar Turkana county, are faced with several infrastructural challenges, including limited water sources leading to unsustainable abstraction from a few existing sources, old stressed systems leading to high non-revenue water of more than 45%, high cost of energy in operating pumping systems and high competing demands with insufficient capital to match the rate of growth in water demand with water infrastructure development.

REACH Programme research on LOWASCO water supply infrastructure demonstrated that applying innovative ways to manage existing water supply infrastructure, such as network analysis, simulation and optimisation tools, and staff capacity building through training and understanding of the network, helps to reduce non-revenue water.

Using the REACH data, a 10-Year Water Service Delivery Plan was developed for LOWASCO; this was subsequently adopted by UNICEF and advanced to a 25-year water service delivery plan for the County. The research has demonstrated that achieving equitable and sustainable water service provision to users within and beyond the network coverage is possible under most water availability scenarios.



Borehole water production measurement at Napuu during a field study.



## IMPROVING WATER QUALITY MANAGEMENT

***5. Groundwater quality information is crucial for sustainable water security in Kenya, as it is a vital source of drinking water and other uses for many communities.***



Borehole drilling rig

The freshwater in the LAAS occurs mainly within recent alluvial and Holocene sediments. Depending on the sub-system, potable groundwater occurs at depths <30m to >100m. However, Cretaceous age rocks, primarily the Turkana Grit and the Miocene age nepheline phonolite rocks, are associated with highly mineralised groundwater at all depths.

A few boreholes, mostly shallow and particularly in Lodwar town, are contaminated with coliforms. Seasonal variations in chemical water quality occurs in the aquifers <100m depth; in particular, turbidity, Fe, Mn, NO<sub>3</sub> and SO<sub>4</sub> increase during the wet season, sometimes beyond WHO recommended limits, reflecting the aquifer's vulnerability to pollution during recharge and the need for a seasons-based adaptive water management and treatment regime.

For the 400km<sup>2</sup> study area, a water quality map has been developed to help guide on where to source and develop potable groundwater supplies for the growing town and its environs, while implementation of the evidence-informed Environmental Management and Monitoring Plan manual and ongoing installation of monitoring boreholes will inform on actions to assure the sustainability of the groundwater resource.



## 6. Translating research evidence into policy and programming is crucial for effective water security interventions in Kenya, bridging the gap between scientific knowledge and practical implementation.

For the REACH research findings to have a real-world impact, it is essential to translate them into actionable policies and programs by disseminating research findings to policymakers and stakeholders, engaging in evidence-based advocacy, and fostering collaboration between researchers and decision-makers.

By integrating research evidence into policy and programming, water security interventions can be designed and implemented based on sound scientific knowledge, leading to more effective and sustainable outcomes. The results of the REACH Kenya programme have been successfully integrated into the Turkana County Climate Change Policy 2021, and associated Act and Regulations, Turkana County Climate Change Action Plan 2023-2027, County Integrated Development Plan (CIDP), and Annual Development Plans (ADP), as well as the Kitui County Water Bill and Act.



Water sector policy-makers attend a national stakeholders event



## STRENGTHENING INSTITUTIONS FOR WATER SECURITY

**7. Universal, safe, and reliable water service delivery for rural communities is achievable by 2030 through professionalised service delivery models such as FundiFix.**



Fundifix technical team repairs water pipe connection

REACH Programme research in Kitui has demonstrated that professionalised maintenance can reduce repair times to less than two days for piped systems and handpumps, compared to 43–67 days on average, under community management. The ability to integrate water quality services, monitoring, reporting, and regulation functions into professionalised models also enables accountability for service quality. Household spending on alternative water sources due to breakdowns in supply can be as much as the initial capital investment for the infrastructure when rural water infrastructure is not professionally maintained.

The REACH Programme has further demonstrated the required enabling environment for professionalised models, including the need to: leverage smart technologies to address information asymmetry in the sector and lower the cost of monitoring and service delivery; formally contract professional service providers by County Governments while providing exclusive service areas to promote economies of scale; embrace efficient, targeted Results-Based Funding (RBF) for professionalised models to supplement user tariffs, which are often inadequate to cover the total cost of service delivery in rural areas, and; develop policies and intervention strategies that appropriately allocate risks, roles, and responsibilities for universal, safe and reliable water service delivery.



## **8. Universal safe water service in schools for drinking, food preparation, handwashing, general hygiene, and sanitation is required to achieve and sustain basic education outcomes.**

Despite national education plans and policies, the allocation of responsibility for WASH services within schools at the county level remains ambiguous. Kenya's national education strategy does not include the cost of delivering safely managed WASH services in schools, while national budget allocations are insufficient and inefficiently allocated. REACH Programme work shows that there is a window of opportunity to improve and sustain WASH services in schools if the following four conditions to improve outcomes are met:

- (i) Clarifying national and county responsibilities for WASH services in schools,
- (ii) Improving monitoring and regulatory capacity for WASH in schools at the county level,
- (iii) Use of information from monitoring systems to rethink funding models.
- (iv) Piloting of performance-based service delivery models with schools to support a national programme of reform.



Lodwar High School girls participate in a community event on forestry & water security

## **9. Research by the REACH Programme has estimated the cost of providing reliable water and handwashing services in rural healthcare facilities (HCFs) to be around KES 150/- per patient visit.**

In Kitui County, costs for water vary with location (distance from the utility piped network) and water source, with vended water being between 27 and 33 times more expensive per unit than piped water. The service cost estimates of KES150/- per patient visit implies that the County Government can now make provisions for safe water and soap supply in healthcare facilities in future county budgets at an annualised cost of KES 300 million.





To achieve a universal service efficiently and accountably, it is also critical that County Governments embrace professional service delivery models to deliver and monitor high-quality WASH services and further aim for a comprehensive (coverage) model working across HCFs, Schools, and Communities sources, to build potential synergies and ensure cost efficiency.

### ***10. Capacity building in the water sector is essential for enhancing knowledge, skills, and expertise, strengthening the capacity of individuals and institutions to address water security challenges effectively.***

Building capacity in the water sector for developing the necessary knowledge, skills, and expertise, while simultaneously addressing the dearth of women in management level in the water sector, are crucial to tackle water security challenges which are multifaceted and multi-dimensional in nature. The capacity building includes providing training programs, workshops, and educational opportunities to individuals working in the water sector, such as water managers, engineers, and policymakers.

Institutional strengthening through promoting knowledge sharing, fostering collaboration, and enhancing water-related organisations' technical and managerial skills is vital. Investing in capacity building and the empowerment of women within the water sector leads to a skilled workforce and effective responses to current and future water security issues.





## REDUCING INEQUALITIES IN WATER SECURITY

**11. Addressing inequalities in vulnerability to climate shocks requires explicit consideration of inequalities in water security programming and equity in investments.**



Women discuss the impact of water insecurity on their family life

Seasonal changes and extreme weather events negatively affect lives and livelihoods where water security is poor. Where populations are affected by extreme poverty and climate resilience is lacking, these impacts can be devastating. Addressing inequalities in access to water resources and services is essential for promoting equitable water security in Kenya. REACH research has investigated the diverse and poorly documented impacts of extreme water-related events on those most vulnerable, offering a deepened understanding of location-specific issues and dynamics – many counter intuitive.

Across the two observatories, people affected by poverty have unequal opportunities to cope with climate shocks. The drivers of inequities are socio-cultural, institutional, and biophysical, such as gendered norms, inequitable water pricing structures, and proximity to water resources. In examining the impact of weather extremes on impoverished populations, REACH research demonstrates that weak institutional structures and poor regulation offer little help to those in need, and therefore evidence-informed strategies need to be shaped and focused on reducing existing inequalities.

**12. Reducing inequalities in access to water resources and services is crucial for achieving equitable water security in Kenya, ensuring that vulnerable and marginalised communities have equal opportunities and rights to safe and reliable water.**

The REACH Kenya programme research concludes that addressing inequalities in access to water resources and services is essential for promoting equitable water security in Kenya. These entail targeted interventions and policies towards vulnerable and marginalised communities, including rural areas, informal settlements, and marginalised groups.



It requires improving infrastructure, increasing water service coverage, and implementing inclusive approaches considering these communities' specific needs and challenges. Reduced inequalities will result in equitable access to water, thereby contributing to sustainable and inclusive development.



Field water sampling from a hand pump for Water Quality tests

### ***13. Community engagement is vital for inclusive and participatory water governance and management in Kenya's drylands, fostering local ownership and sustainable solutions.***

Involving local communities in water governance and management is essential for achieving sustainable water security in Kenya's drylands. Community engagement promotes inclusive decision-making processes, local ownership of water resources, and the development of context-specific solutions.

Empowering communities through awareness programs, capacity-building initiatives, and participatory approaches that encourage active participation in water-related activities is essential. As communities' involvement and sustainable water management practices are realised, governments and water institutions ensure that the needs and aspirations of local populations are addressed effectively.

Leaders and their community celebrate achievements in forestry & water security





KENTANK

COUNTY GOVT. OF KITUI. F.Y. 2015/2016.





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Improving water security for the poor



REACH Kenya



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